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## A clinical study of different causes in unilateral sensorineural hearing loss

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### Abstract

**Background:** Unilateral sensorineural hearing loss (USNHL) is important to be identified and diagnosed early. It is common and can be a symptom of a wide range of diseases. In our region, south India, the USNHL has not been studied before. In this study we report different causes of this entity.

**Method and Aim:** This is a Prospective observational Hospital based study, review of 50 patient with USNHL in the age group above 18yrs. We aim to find the risk factors, causes, common presentation of USNHL in the south India and comparing the result with a literature review.

**Result:** It was found, 50 cases were presented with unilateral SNHL during the study period. It constitutes 15% of cases screened. Most of our cases had gradual onset of hearing loss. Tinnitus, vertigo and ear discharge were the most common associated symptoms respectively. On audiological assessment: PTA at time of investigation, severe hearing loss (46%). Etiologies of unilateral sensorineural hearing loss, Meniere's disease (28%), Metabolic (24%), Sudden SNHL (22%), idiopathic (20%), Acoustic neuroma (4%) and Left COM, squamosal disease (2%). MRI was done in all 50 cases with unilateral SNHL, in 4 cases it found to be abnormal. ENG was done in 35 of cases of which it is abnormal in 30 cases, Left Hypo active labyrinth (48.6%).

**Conclusion:** All patients with USNHL need full audiological screening and early diagnosis. Regarding our study, we recommend MRI as part of their diagnostic workup. The choice of diagnostic laboratory tests should be directed by patient risk factors and exposures.

**Keywords:** Unilateral sensorineural hearing loss, single side hearing loss, sensorineural hearing loss

### Introduction

Hearing impairment is one of the most frequent disabilities. It represents great risk to backwardness, communication, social development and also to auditory processing. Unilateral hearing loss and audio vestibular symptoms are common in the population and can be associated with Retro cochlear tumors such as Acoustic neuroma.

In Sensorineural hearing loss (SNHL) the pathology lies in vestibulo cochlear nerve (viii N), the inner ear, or central processing centers of the brain. Sensorineural hearing loss can be mild, moderate, severe or profound. The majority of the causes of sensorineural hearing loss are cochlear origin only, a few of cases are retro cochlear origin.

Sensorineural hearing loss (SNHL) is a complex disease influenced by interactions between multiple internal and external causative factors. Genetics and age-related hearing changes may predetermine a patient's hearing throughout their lifetime, and any potential hearing changes over time may be accelerated by numerous external factors.

Hearing loss is a common sensory disorder affecting tens of millions of individual of all ages in United States <sup>[1]</sup>. In 2003 to 2004, the prevalence of hearing loss in the adult US population aged 20 to 69 years was 16.1% (29 million Americans), and 31% of those had a high-frequency hearing loss. It can be expected that the prevalence and impact of hearing loss on society will increase as the elderly proportion of the population in many industrialized nations continues to grow <sup>[2]</sup>.

The incidence of SSNHL has been estimated by Byl <sup>[3]</sup> to range between 5 and 20 cases per 100,000 persons per year. Sudden sensorineural hearing loss is usually unilateral and can be associated with tinnitus and vertigo. In most cases the cause is not identified, although various infective, vascular, and immune causes have been proposed. A careful examination is needed to exclude life threatening or treatable causes such as vascular events and malignant diseases, and patients should be referred urgently for further assessment.

The complexity of the diagnostic evaluation and potential treatment options for SNHL has increased because of multiple considerations. There is a downward trend in the presenting age and an increasing severity of hearing loss in patients from first-world (industrialized) nations. Patterns of hearing loss have changed in relation to noise exposure because of various occupational hazards such as heavy industrial noise and firearms use in military and police occupations. Clinicians involved in the management of critically ill and complex medical patients are aware of the impact that pharmaceutical therapy for multisystem disease may have on hearing.

Patients who have immigrated from developing countries may present with hearing loss caused by exposure to rare pathogens such as Lassa fever [4]. Or with a chronic otitis media complicated by a lack of primary care or access to an otolaryngologist in their country of origin. Thus, it is prudent for any practicing otolaryngologist to be aware of these and other factors that may influence their diagnostic and management approaches for patients presenting with SNHL.

Since there is not much data available with differential diagnosis and management of unilateral sensorineural hearing loss with intact tympanic membrane to co-relate with other co-morbidities among Indian population. Most of the clinical studies done on hearing loss are involving both conductive and sensorineural hearing loss and are bilateral SNHL. There is a need for a clinical study to find the pattern of degree of hearing loss in different age group, sex and among patients suffering from co-morbidities such as Diabetes mellitus, Hypertension, Dyslipidemia, Smoking & Alcohol.

The medical literature contains thousands of research papers on SNHL, the overall aim of which is to improve our ability as clinicians to diagnose and treat patients with hearing loss. The aim of this study is to present the current best evidence available regarding the diagnostic process and treatments available for the management of hearing loss as it applies to the more controversial aspects of adult SNHL.

By doing this study we can identify the clinical profile of unilateral sensorineural hearing loss such as age, sex, onset, progression, associated symptoms, co morbid conditions and grading of hearing loss by different types. Investigation to identify the etiology or diagnosis of unilateral SNHL.

#### Formula used

$$SS = \frac{Z^2 \times (p) \times (1 - p)}{C^2}$$

SS = Sample Size

Z = Z-value<sup>A</sup> (e.g., 1.96 for a 95 percent confidence level)

P = Percentage of population picking a choice, expressed as decimal<sup>B</sup>

C = Confidence interval, expressed as decimal (e.g., .04 = +/- 4 percentage points)

A Z-values (Cumulative Normal Probability Table) represent the probability that a sample will fall within a certain distribution.

The Z-values for confidence levels are:

1.645 = 90 percent confidence level

1.96 = 95 percent confidence level

2.576 = 99 percent confidence level

#### Methodology: Data collection technique and tools

All selected cases underwent a thorough history taking and ENT examination. A proper history was elicited from the

Treatment given to the cases according to standard protocol.

#### Objectives of the Study

1. To study the different causes of unilateral sensorineural hearing loss in adults.
2. To study the various associated clinical features and the varied manifestations of unilateral sensorineural hearing loss.

#### Materials and Method

**Study design:** Prospective observational study.

**Study area:** This is a cross-sectional, Hospital based study was carried out in ENT OPD of Apollo Hospital Chennai. The hospital caters not only to the population based in Chennai, but is also a tertiary referral center for the patients from other states like West Bengal, Assam and Arunachal Pradesh.

**Period of study:** October 2012 to September 2013

#### Inclusion criteria

All cases which are presented with unilateral sensorineural hearing loss aged above 18yrs who attended ENT OPD during the study period were included.

#### Exclusion criteria

1. Cases with Bilateral hearing loss.
2. Cases with mixed/conductive hearing loss.
3. Patients with ototoxicity, noise induced hearing loss, presbycusis, congenital causes.
4. Age less than 18 yrs.

#### Sample size estimation

We have taken our hospital records as our base, Since there were no such studies available in the local set up. Which shows the prevalence of unilateral sensorineural hearing loss as 15% among the screened symptomatic ENT patients in the year October 2011 to September 2012.

That percentage of patients presented with unilateral sensorineural hearing loss was 15% (0.15) [P]. The required sample size was estimated 50 with Z- 95% power with CI- 1.96 and allowable error of 10 % (0.1).

patients, and a general and systemic examination was also carried out. Pure tone audiogram and MRI scan of brain was carried out for all patients. The relevant cases underwent

appropriate investigations like electronystagmogram, haematological tests like ESR, blood sugar levels, cholesterol, triglycerides and TSH levels. The diagnosis was made eventually and the cases underwent appropriate surgical or medical management and the results were analyzed.

**Ethical committee approval**

Preceding the study, approval for the study was obtained from institutional research ethical community.

**Methodology: Data collection technique and tools**

Data validation and entry was done in MS Excel spread sheet. All the continuous variables were assessed for the normality using Shapiro Wilk’s test. If the variables follow Gaussian distribution, they were expressed as mean± standard deviation otherwise. All the categorical variables were expressed as either by percentage or proportion. All the categorical comparisons were done by Chi Square test or Fisher Exact test based on the number of observation. All the p values less than 0.05 were considered as statistically significant. All the analysis was carried out by using a statistical software SPSS version 11.

**Results**

**Table 1:** Baseline

Baseline Table	
Age	Mean-48.54yrs SD-12.89
Sex	Male-34(68%)
	Female-16(32%)
Side of illness	Right-20(40%)
	Left-30(60%)
Mode of Onset	Sudden -11(22%)
	Fluctuating- 13(26%)
	Gradual- 26(52%)
Duration (Days)	Mean - 854.06 SD-945.22889
Clinical symptoms	Giddiness-23(46%)
	Tinnitus-31(62%)
	Ear discharge-1(2%)
Co-morbid status	DM-11(22%)
	DM&HTN-2(4%)
	DM &Renal transplant-1(2%)
	Dyslipidemia-2(4%)
	Epistaxis-1(2%)
	Fatty liver-2(4%)
	Hypothyroidism-1(2%)
	GERD-1(2%)
	Nil-29(58%)
	Tymphnic membrane

50 patients aged above 18 years with sensorineural hearing

loss attending to ENT OPD at Apollo Hospital and Research Centre, Chennai from Oct 2012 - Sept 2013 were studied. Observations recorded in the study are described under the following heading.

**Table 2:** Percentage of Grading of sensorineural hearing loss according to Goodman and Clark classification

Grading of hearing loss	According to Goodman and Clark
	No of Cases (%)
Moderate	8 (16)
Moderately severe	6 (12)
Severe	2 (4)
Profound	23 (46)

**Table 3:** Percentage of Grading of sensorineural hearing loss based on shape of audiogram

Grading of hearing loss	According to shape of audiogram
	No of Cases (%)
Low frequency loss	9 (18)
High frequency loss	1 (2)
Sloping	1 (2)
Total	11 (22)

Out of 50 cases, 23 (46%) patients were having profound SNHL, 8 (16%) patients were having moderate SNHL, 6 (12%) patients were having moderately severe SNHL and 2(4%) were having severe SNHL. Grading based on shape of audiogram low frequency loss 9 (18%), high frequency loss 1 (2%) and sloping 1 (2%).

Profound hearing loss was common in (46%) of cases followed by low frequency loss (18%) followed by moderate hearing loss (16%)

**Table 3:** Age wise distribution of SNHL

Age	No of cases (%)
< 40 yrs	14 (28)
41-45 yrs	3 (9)
46-50 yrs	5 (10)
51-55 yrs	13 (26)
> 55 yrs	15 (30)

Out of the 50 patients who presented with unilateral SNHL. 14(28%) patients were in the group less than 40yrs. between 40-45yrs their were 3(6%) cases. 5(10%) patients were between 45-50yrs. between 51-55yrs their were 13(26%) cases. >55yrs age 15(30%) patients were presented. SNHL was common in age group more than >50yrs, together constitutes 56% of patients.

**Table 4(A):** Age wise distribution of grading of hearing loss P value- 0.829

Age wise distribution of grading of hearing loss according to Goodman and Clark						
Age wise distribution		Grading of hearing loss audiogram				Total
		Moderate	Moderately severe	severe	profound	
< 40 yrs	Count (%)	2(25)	1(16.7)		5(21.7)	8(20.5)
41-45 yrs	Count (%)				3(13)	3(7.7)
46-50 yrs	Count (%)		2(33.3)		3(13)	5(12.8)
51-55 yrs	Count (%)	2(25)	1(16.7)	1(50)	5(21.7)	9(23.1)
> 55 yrs	Count (%)	4(50)	2(33.3)	1(50)	7(30.4)	14(35.9)
Total	Count (%)	8(100)	6(100)	2(100)	23(100)	39(100)

**Table 4(B):** Age wise distribution of grading of hearing loss P value- 0.476

Age wise distribution of grading of hearing loss according to shape of audiogram							
Grading of hearing loss according to shape of audiogram		Age wise distribution					Total
		< 40 yrs	41-45 yrs	46-50 yrs	51-55 yrs	> 55 yrs	
High frequency loss	Count (%)				1(7.7)		1(2)
Low frequency loss	Count (%)	6(42.9)			2(15.4)	1(6.7)	9(18)
Sloping	Count (%)				1(7.7)		1(2)

Age ranged from 18 to 75 years. Out of 14 cases below 40 years of age, 2 were of moderate SNHL, 1 was of moderately severe SNHL, 5 were of profound SNHL and 6 were low frequency loss.

Among 3 patients in the age group of 40-45 yr all were of profound SNHL. Out of 5 cases in the age group 45-50 yr, 2 were of moderately severe SNHL and 3 were of profound SNHL.

Among 13 cases in the age group 50-55 yr 2 were of moderate SNHL, 1 was of moderately severe SNHL, 1 was of severe SNHL, 5 were of profound SNHL and 2 were low frequency loss, 1 was of high frequency loss and 1 was of sloping type, Among 10 cases in the age group above 55 yrs, 4 was of moderately severe SNHL, 2 was of moderately severe SNHL, 1 was of severe SNHL, 7 were of profound SNHL and 1 was a low frequency loss.

**Table 5:** Sex wise distribution of grading of hearing loss P value - 0.827

Sex wise distribution		Grading of hearing loss							Total
		High frequency loss	Low frequency loss	Moderate	Moderately severe	severe	profound	sloping	
Male	Count (%)	1(100)	7(77.8)	4(50)	4(66.7)	1(50)	16(69.6)	1(100)	34(68)
Female	Count (%)		2(22.2)	4(50)	2(33.3)	1(50)	7(30.4)		16(32)
Total	Count (%)	1(100)	9(100)	8(100)	6(100)	2(100)	23(100)	1(100)	50(100)

Out of 50 patients 34 (64%) were males and 16 (32%) were females. The male to female ratio was 2.12:1. Low frequency hearing loss and profound SNHL were

common in males. There was no statistically significant association with sex and distribution of grading of hearing loss with P value of 0.827.

**Table 6:** Comparison of grading of hearing loss with onset of SNHL P value-0.01

Onset of symptoms		Grading of hearing loss							Total
		High frequency loss	Low frequency loss	Moderate	Moderately severe	severe	profound	Sloping	
Fluctuating	Count (%)		8(88.9)	4(50)	1(16.7)				13(26)
Gradual	Count (%)	1(100)	1(11.1)	4(50)	3(50)	1(50)	15(65.2)	1(100)	26(52)
Sudden	Count (%)				2(33.3)	1(50)	8(34.8)		11(22)
Total	Count (%)	1(100)	9(100)	8(100)	6(100)	2(100)	23(100)	1(100)	50(100)

Fluctuating hearing loss was found in 13(26%) of cases, 88.9% of low frequency loss has got fluctuating hearing loss. Gradual onset was found in 26(56%) of cases, 65.2% of Profound SNHL has got gradual onset hearing loss. Sudden onset hearing loss found in 11(22%) of cases, 34.8% of profound SNHL has got sudden hearing loss, with P value <0.05. Which is statistically significant. Low frequency hearing cases more presents has fluctuating

course and most of them were meniere's disease.

**Table 7:** Clinical symptoms with Sensory neural hearing loss

Clinical symptoms	No of cases (%)
Giddiness (vertigo)	23 (46)
Tinnitus	31 (62)
Ear discharge	1 (2)
Both vertigo and tinnitus	3 (6)

**Table 8:** Co relation of clinical symptoms with grading of hearing loss according to Goodman and Clark Table -8(A)-Giddiness P value -0.238

Clinical symptom			Grading of hearing loss				Total
			Moderate	Moderately severe	severe	profound	
Giddiness	yes	Count (%)	6 (75)	2 (33.3)	1 (50)	8 (34.8)	17 (44.6)
	No	Count (%)	2 (25)	4 (66.7)	1 (50)	15 (65.2)	22 (55.4)
Total		Count (%)	8 (100)	6 (100)	2 (100)	23 (100)	39 (100)

Giddiness was the presenting symptom in 43.6% of SNHL according to Goodman and Clark classification. 75% of moderate SNHL had got giddiness. 33.3% of moderately

severe SNHL and 34.8% of profound SNHL had presented with giddiness. But this was not atavistically significant with P value of 0.238.

**Table 8:** (B) Tinnitus P value- 0.076

Clinical symptom			Grading of hearing loss				Total
			Moderate	Moderately severe	severe	profound	
Tinnitus	yes	Count (%)	7 (87.5)	3 (50)		10 (43.5)	20 (51.3)
	No	Count (%)	1 (12.5)	3 (50)	2 (100)	13 (56.5)	19 (48.7)
Total		Count (%)	8 (100)	6 (100)	2 (100)	23 (100)	39 (100)

Tinnitus was presenting symptom with 51.3% of SNHL according to Goodman and Clark classification. 87.5% of moderate SNHL had got tinnitus. 56.5% of profound SNHL

had presented with tinnitus. But this was not statistically significant with P value of 0.076.

**Table 8(C):** Ear discharge P value- 0.87

Clinical symptom			Grading of hearing loss				Total
			Moderate	Moderately severe	severe	profound	
Eardischarge	yes	Count (%)				1 (4.1)	1 (2.6)
	No	Count (%)	8 (100)	6 (100)	2 (100)	22 (95.9)	38 (97.4)
Total		Count (%)	8 (100)	6 (100)	2 (100)	23 (100)	39 (100)

Ear discharge was the presenting symptom with 2.6% of SNHL according to Goodman and Clark classification. 4.3%

of profound SNHL had presented with ear discharge. But this was not statistically significant with P value of 0.87.

**Table 9:** Corelation of co-morbidities with grading of hearing loss according to Goodman and Clark

Co morbidities		Grading of hearing loss				Total
		Moderate	Moderately severe	severe	Profound	
DM	Count (%)	2 (25)	3 (50)		6 (26.1)	11 (28.2)
DM+HTN	Count (%)	1 (12.5)			1 (4.3)	2 (5.1)
DM+renal transplant	Count (%)				1 (4.3)	1 (2.6)
Dyslipidemia	Count (%)		1 (16.7)		1 (4.3)	2 (5.1)
Epistaxis	Count (%)				1 (4.3)	1 (2.6)
Fatty liver	Count (%)			1 (50)		1 (2.6)
GERD	Count (%)				1 (4.3)	1 (2.6)
Hypothyroidism	Count (%)	1 (12.5)				1 (2.6)
Nil	Count (%)	4 (50)	2 (33.3)	1 (50)	12 (52.2)	19 (48.7)
Total	Count (%)	8 (100)	6 (100)	2(100)	23 (100)	39 (100)

19 (48.7%) of cases had no co-morbidities, 12 (52.2%) of profound SNHL had no co-morbidities. Diabetes mellitus was presented in 11 (28.2%), 26.1% of profound SNHL had diabetes mellitus. Hypertension and diabetes mellitus together was presented in 2 (5.1%), 1 case had profound SNHL and another Moderate SNHL. Dyslipidemia was

found in 2 (5.1%), 1 case had profound SNHL and another Moderately severe SNHL. Hypothyroidism was found in 1 (2.6%) of case in moderate SNHL. Diabetes mellitus and renal transplant together was found in 1 (2.6%) of profound SNHL. Fatty liver was found in 1 (2.6%) of severe SNHL.

**Table 10:** Analysis of Duration and investigation of SNHL

	N	Minimum	Maximum	Mean	Std Deviation
Age (yrs)	50	18.00	74.00	48.5	12.98
Duration (hrs)	50	1.00	3600.00	854.06	94.52
Total cholesterol	50	140.00	300.00	176.02	36.22
Triglycerides	50	113.00	320.00	136.16	39.14
TSH	50	2.00	3.60	3.012	0.44

The mean age of presentation of SNHL is 48.5yrs and SD of 12.98 with 2 SD deviation, the age group is (61.48-35.52).

Duration of SNHL at the time of presentation mean- 854.06hrs (35.4 days).

**Table 11:** Analysis of Investigations with SNHL

ESR	Mean	Standard deviation	P
Moderate	13.37	4.20	>0.05
Moderately severe	12.33	2.16	
Severe	21.00	4.24	
Profound	13.73	2.32	
Cholesterol(mg/dl)	Mean	Standard deviation	P
Moderate	189.25	47.51	>0.05
Moderately severe	175.50	17.03	
Severe	230.50	77.07	
Profound	173.00	36.80	
Triglycerides(mg/dl)	Mean	Standard deviation	P
Moderate	124.75	12.99	>0.05
Moderately severe	125.83	6.14	
Severe	125.50	3.535	
Profound	147.95	55.14	
TSH mcg/dl	Mean	Standard deviation	P
Moderate	3.18	0.344	>0.05
Moderately severe	2.90	0.58	
Severe	3.04	0.14	
Profound	2.96	0.44	

Statistical analyses were carried out using Kruskal Wallis test. The mean values of ESR, Cholesterol, Triglycerides and TSH among different degree of SNHL were found out

to be similar. The P value was being >.05 was not statistically significant.

**Table 12:** Co-relation of ENG with grading of hearing loss

ENG		Grading of hearing loss							Total
		High frequency loss	Low frequency loss	Moderate	Moderately severe	severe	profound	sloping	
Left Hypo active labyrinth	Count (%)		6 (66.7)	3 (50)	2 (66.7)	1 (50)	5(38.5)		17 (48.6)
right hypo active labyrinth	Count (%)		2 (22.2)	2 (33.3)	1 (33.3)	1 (50)	7(53.8)		13 (37.1)
Normal	Count (%)	1 (100)	1 (11.1)	1 (16.7)			1 (7.7)	1 (100)	5 (14.3)
Total	Count (%)	1 (100)	9 (100)	6 (100)	3 (100)	2 (100)	13(100)	1 (100)	35 (100)

P value- 0.195

ENG was done in 35 of cases of which it is abnormal in 30 cases, Left Hypo active labyrinth in 17 (48.6%), Right hypo active labyrinth 13 (37.1%). Left hypoactive labyrinth patients has more of low frequency loss (66.7%). Right hypoactive labyrinth patients has more of profound hearing loss (53.8%). It was not statistically significant as P value >0.05.

**Analysis of MRI for diagnosis of SNHL**

MRI was done in all 50 cases with unilateral SNHL, in 4 cases it found to be abnormal and they were left mastoid opacity with eroded ossicles, Right CP angle lesion, Right Acoustic neuroma and Dominant left vertebral artery, bilateral fetal origin of post cerebral arteries.

**Table 13:** Etiologies of Unilateral SNHL

Etiologies of unilateral SNHL	No of cases (%)
Idiopathic	10 (20)
Sudden SNHL	11 (22)
Metabolic cause	12 (24)
Meniere's disease	14 (28)
Acoustic neuroma	02 (4)
Left COM, squamosal disease	01 (2)
	50 (100)

Etiologies of unilateral SNHL were follows Meniere's disease in 14 (28%) followed by Metabolic in 12(24%) of cases, Sudden SNHL in 11(22%) of cases, idiopathic in 10 (20%) of cases, Acoustic neuroma in 2 (4%) of cases and Left COM, squamosal disease in 1 (2%) of cases.

**Table 14:** Co relation of Etiology with grading of hearing loss

Diagnosis		Grading of hearing loss							Total
		High frequency loss	Low frequency loss	Moderate	Moderately severe	severe	profound	sloping	
Metabolic cause	Count (%)			2 (25)	3 (50)		7 (30.4)		12 (24)
Sudden SNHL	Count (%)				2 (33,3)	1 (50)	8 (34.8)		11 (22)
Meniere's disease	Count (%)		9 (100)	4 (50)	1 (16.7)				14 (28)
right acoustic neuroma	Count (%)			1 (12.5)			1 (4.3)		2 (4)
left com, squamosal disease	Count (%)						1 (4.3)		1 (2)
Idiopathic	Count (%)	1 (100)		1 (12.5)		1 (50)	6 (26.1)	1(100)	10 (20)
Total	Count (%)	1 (100)	9 (100)	8 (100)	6 (100)	2(100)	23(100)	1(100)	50(100)

P value - 0.007

Meniere's disease 9(100%) of cases presented as low frequency loss. Which is statistically significant with p value <0.05.

Metabolic causes found in 12 (24%) of cases of which 7 cases of profound SNHL, 3 cases of moderately severe and 2 cases of moderate SNHL.

Sudden SNHL was found in 11(22%) of cases 8 cases of profound SNHL, 2 cases of moderately severe and 1 cases of severe SNHL.

**Discussion**

This study was carried out in Apollo Hospital and Research Centre, Chennai from Oct 2012-Sept 2013. The cases which presented with unilateral sensorineural hearing loss to OPD were taken into the study. During the study, it was found, 50 cases were presented with unilateral SNHL during the study period. It constitutes 15% of cases screened. SNHL was one of the important otologic emergency presenting to ENT OPD.

**Grading of sensorineural hearing loss**

In our study grading of hearing loss according to Goodman

and Clark, among the cases presented as follows 23 (46%) patients were having profound SNHL, which is the common grade of presentation in our study, 8 (16%) patients were having moderate SNHL, 6 (12%) patients were having moderately severe SNHL and 2 (4%) were having severe SNHL.

Grading based on shape of audiogram high frequency loss 9 (18%), low frequency loss 1 (2%) and sloping 1 (2%).

In a study conducted by Flavia Alencar de Barros *et al.* [15] two patients (10%) showed a mild level of initial loss, four (20%) showed a moderate level, four (20%) showed a severe level, and six (30%) showed a profound level of hearing loss.

**Age Predilection in Different Studies**

In our study common age group of presentation of unilateral SNHL was more than 55 yrs which constitutes 30% of cases, followed by <40yrs with 28% and between 50-55yrs 26%. Mean age of presentation of unilateral SNHL was 48.54yrs (SD = 12.89, Range =18-74yrs) in our study.

A study conducted by Yimtae K, *et al.* [16] showed the average age of onset was 43.7 years (SD = 13.46, range =

13-66 years).

Byl *et al.* [3] found the average age of at onset is reported to be 46-49yrs with increasing incidence with age. Byl 1984.

A study conducted by Tiong TS *et al.* [17] had the age range between 12 to 79yrs, the mean age of onset was 49 yrs.

Steven D. Rauch *et al.* [18] study showed sudden sensorineural hearing loss typically occurs between 43 years and 53 years of age, with equal sex distribution.

The mean age of presentation of our study is similar to other studies.

In Shaia and Sheehy study [19] which included 1220 cases three quarter of patients were over the age of 40yrs. The age of onset of symptoms are as follows <30yrs-13%, 30-39yrs-13%, 40-49yrs-21%, 50-59yrs-22%, 60-69yrs-18%, >70yrs-13%.

In age wise presentation of grading of hearing loss, profound SNHL was common grade of hearing loss in age group above 40yrs. High frequency hearing loss was common in age <40yrs.

#### Sex wise distribution of grading of hearing loss

A study conducted by Yimtae K, *et al.* [16] showed of the fifty-six patients, 34 (60.7%) were females and 22 (29.3%) males ratio of 0.65:1.

A study conducted by Tiong TS *et al.* [17] found the ratio of male to female was and 25 to 28 (0.9:1). Singapore 2007.

In our study, out of 50 patients 34 (64%) were males and 16 (32%) were females. The male to female ratio was 2.12:1. Compare to other studies males are commonly affected.

In our study male preponderance was present in our study but in other studies Tiong TS *et al.* [17] and Yimtae K, *et al.* [16] showed females are commonly affected.

#### Side of lesion of SNHL

The involvement of side of SNHL in our study is as follows Left side 30 (60) and right side 20 (40), left side more involvement.

Similar result found in Tiong TS *et al.* [17] study conducted in Singapore with left side 30(56.6%) and right side 23 (43.4%).

#### Onset of hearing loss

The following are the onset of presentation in our study with, Fluctuating hearing loss was found in 13(26%), Gradual onset was found in 26(52%), Sudden onset hearing loss found in 11(22%) of cases.

88.9% of low frequency loss has got fluctuating hearing loss. 62.5% of Profound SNHL has got gradual onset hearing loss. 34.8% of profound SNHL has got sudden hearing loss, with P value <0.05. Which is statistically significant.

#### Duration of SNHL at the time of presentation

In our study mean duration symptoms of unilateral of SNHL at the time of presentation is 854.06 hrs (35.5 days).

In Flavia Alencar de Barros *et al.* [15] study only four patients (20%) sought our services after the tenth day: one (5%) between days 11 and 20 with a profound level of initial loss; one (5%) between days 21 and 30 with a severe initial loss; and two (10%) after more than 31 days, of whom one had moderate loss and the other had severe loss.

#### Clinical symptoms with unilateral Sensory neural hearing loss

In Tiong TS *et al.* [17] study the main presenting symptoms were deafness (40 patients), tinnitus (38), and vertigo (12).

In Flavia Alencar de Barros *et al.* [15] study seven patients

(35%) had exclusively associated with tinnitus; three (15%) showed tinnitus plus ear blockage; five (25%) showed tinnitus plus vertigo; one (5%) showed tinnitus plus vertigo plus ear blockage; one (5%) showed ear blockage and three (15%) showed only hearing loss. Given these results, the most common symptom associated with the hearing loss was tinnitus, which appeared in 16 patients (80%).

In our study the presenting complaints were tinnitus 31 (62%), vertigo (giddiness) 23 (46%), both vertigo and tinnitus 3 (6%) and ear discharge 1 (2%).

Similar to Tiong TS *et al.* [17] and Flavia Alencar de Barros *et al.* [15] studies in our study also tinnitus was the common presenting symptoms along with hearing loss.

Association of clinical symptoms with grading of hearing loss according to Goodman and Clark classification. Giddiness was the presenting symptom in 43.6% of SNHL, Tinnitus was presenting symptom with 51.3% of SNHL, Ear discharge was the presenting symptom with 2.6% of SNHL. But its association with grading of hearing loss is not statistically significant.

#### Co-morbidities associated with SNHL

In Tiong TS *et al.* [17] study out of 50 patient, 16 patients were found to have associated conditions of diabetes mellitus, seven with hypertension, and 12 with hyperlipidaemia.

Chamyal P C *et al.* [19] found hearing loss mild to moderate and was detected in 40% of diabetes.

In our study of the 50 patients, 14 patient had diabetes mellitus of which 2 had hypertension and one was post renal transplant patient. One with dyslipidemia and one with hypothyroidism. Other causes were GERD, epistaxis and fatty liver.

In our study diabetes mellitus was associated in 14 (26.1%) of cases of which 2 cases associated with hypertension and one with post renal transplant. Onset of hearing loss was gradual in 10 (71.4%) of cases, and 57.1% of cases had profound hearing loss. Diabetes mellitus was associated with gradual onset profound hearing loss at presentation.

#### ENG with grading of hearing loss

ENG was done in 35 of cases of which it is abnormal in 30 cases, Left Hypo active labyrinth in 17 (48.6%) of which 10 cases were menieres disease, Right hypo active labyrinth 13 (37.1%) of which 4 cases of each metabolic and sudden SNHL, 3 cases were menieres disease.

Left hypoactive labyrinth patients has more of low frequency loss (66.7%). Right hypoactive labyrinth patients has more of profound hearing loss (53.8%) but it was not statistically significant.

#### Etiologies of Unilateral SNHL

In our study following are the etiologies found for unilateral SNHL, Meniere's disease in 14 (28%) followed by Metabolic in 12(24%) of cases, Sudden SNHL in 11(22%) of cases, idiopathic in 10 (20%) of cases, Acoustic neuroma in 2 (4%) of cases and Left COM, squamosal disease in 1 (2%) of cases.

Chau JK *et al.* [21] conducted a meta-analysis showed etiologies for patients suffering sudden sensorineural hearing loss included idiopathic (71.0%), infectious disease (12.8%), otologic disease (4.7%), trauma (4.2%), vascular or hematologic (2.8%), neoplastic (2.3%), and other causes (2.2%).

Koc A *et al.* [22] did a literature survey of recent studies found etiology for SNHL were viral inflammation, vascular diseases, allergic reaction, rupture of intralabyrinthine membranes, and autoimmune diseases.

Approximately 1% of cases of sudden sensorineural hearing loss are due to “retro-cochlear” disorders that may be related to vestibular schwannoma, demyelinating disease, or stroke. 3 Another 10 to 15% are due to another identifiable cause, such as Meniere’s disease, trauma, autoimmune disease, syphilis, Lyme disease, or perilymphatic fistula. 4, 5 The remainder are idiopathic and almost exclusively unilateral.

### Management of unilateral sensorineural hearing loss

In our study in 26 (52%) of cases were reassured, medical management was done in 18(36%) of cases, surgical management was done in 3(6%) and hearing aid was prescribed in 3(6%) of cases.

Intratympanic gentamycin injection was given in 14(28%) of cases, Intratympanic steroid injection was given in 3(6%) of cases, Intratympanic steroid injection and pentoxifyllin was given in 1(2%) case. Surgical intervention was done 3 cases, Right acoustic neuroma surgery in 2(4%) cases and left mastoid exploration in 1(2%) case.

Intratympanic gentamycin injection was given in 12 cases of meniere's disease. Intratympanic steroid injection was given in 3 cases of sudden SNHL. Intratympanic steroid injection and pentoxifyllin was given in a case of sudden SNHL.

In Wilson and colleagues, 18 study showed a statistically significantly greater rate of SSNHL recovery than oral placebo. Multiple placebo-controlled studies have since suggested value in the use of oral corticosteroids for the treatment of SSNHL.

Rauch and colleagues *et al.* [18] compared TTS with oral treatment as primary concluded that TTS were not inferior to oral steroids among patients with idiopathic SSNHL.

In study conducted by Flavia Alencar de Barros *et al.* [15] evaluated the effectiveness of pentoxifyllin and prednisone in treatment of SNHL, analyzed through conventional audiograms, and speech audiometry was performed in the acute stage and during the treatment. Six patients (30%) with a light or moderate level of hearing loss at the beginning, five (25%) had normalized hearing in the second week of treatment

### Conclusions

- Sensorineural hearing loss is one of the important clinical presentation to ENT OPD. The prevalence of unilateral sensorineural hearing loss is 15%.
- Common age group of presentation of unilateral SNHL is more than 55yrs (30%) and males were commonly affected ratio of 2.12:1.
- Profound sensorineural hearing loss is the common grade of hearing loss in age group more than 40yrs.
- The common side of lesion of unilateral SNHL was left side (60%).
- Most common clinical symptoms which presented with SNHL was tinnitus (62%)
- Most common type of onset of SNHL was gradual onset of hearing loss (52%).
- Diabetes mellitus was most common Co morbidities associated with SNHL.
- Common etiologies of unilateral sensorineural hearing loss were Meniere's disease in 14 (28%) followed by

Metabolic in 12(24%) of cases, Sudden SNHL in 11(22%) of cases, idiopathic in 10 (20%).

- Most of the cases were managed by reassurance (52%). Other cases were managed by medical management in done 18(36%) of cases, surgical management was done in 3(6%) and hearing aid was prescribed in 3(6%) of cases.

### Summary

- 50 cases of unilateral sensorineural hearing loss aged above 18yrs who attended ENT opd of Apollo Hospital Chennai were reviewed.
- In these cases, grading of hearing loss, onset, clinical feature, comorbidities, investigation, diagnosis and management were studied.
- Unilateral sensorineural hearing loss was presented in 15% of the cases screened during this period.
- Grading of hearing loss which common was profound SNHL (46%) followed by low frequency loss (18%) and moderate SNHL (16%). Profound hearing loss was common in all age group above 40yrs, low frequency hearing loss was common in age less than 40yrs.
- Gradual onset of hearing loss (52%) was common followed by fluctuating hearing loss (26%). Sudden onset hearing loss was 22%. 65.2% of profound SNHL has got gradual onset hearing loss. Low frequency hearing cases presents has fluctuating onset and most of them were meniere's disease.
- Clinical symptoms which was commonly presented with SNHL was tinnitus (62%). Vertigo was presented in 46%.
- Co morbidities associated with SNHL were Diabetes mellitus, hypertension, hyperlipidemia and hyperthyroidism. Diabetes mellitus was common 14 cases of which 2 cases with hypertension and 1 with renal transplant.
- Diabetes mellitus was associated in 14 (26.1%) of cases. Onset of hearing loss was gradual in 10 (71.4%) of cases, and 57.1% of cases had profound hearing loss. Diabetes mellitus was associated with gradual onset profound hearing loss at presentation.
- Etiologies of unilateral sensorineural hearing loss were follows Meniere's disease in 14 (28%) followed by Metabolic in 12(24%) of cases, Sudden SNHL in 11(22%) of cases, idiopathic in 10 (20%) of cases, Acoustic neuroma in 2 (4%) of cases and Left COM, squamosal disease in 1 (2%) of cases.
- Meniere's disease 9 (100%) of cases presented as low frequency loss was. Which is statistically significant with p value <0.05.
- Metabolic causes found in 12 (24%) of cases of which 7 cases of profound SNHL, 3 cases of moderately severe and 2 cases of moderate SNHL.
- Sudden SNHL was found in 11(22%) of cases, of which 8 cases were profound SNHL, 2 cases are moderately severe and 1 case was severe SNHL.
- Management of unilateral SNHL-In 26 (52%) of cases were reassured, medical management in done 18(36%) of cases, surgical management was done in 3(6%) and hearing aid was prescribed in 3(6%) of cases.
- Intratympanic gentamycin injection was given in 14(28%) of cases, Intratympanic steroid injection was given in 3(6%) of cases, Intratympanic steroid injection

and pentoxifyllin was given in 1(2%) case. Surgical intervention was done 3 cases, Right acoustic neuroma surgery in 2(4%) cases and left mastoid exploration in 1(2%) case.

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